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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/212,726	12/15/1998	KLAUS F. SCHUEGRAF	M122-1098	7984

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WELLS ST. JOHN P.S.
601 W. FIRST AVENUE, SUITE 1300
SPOKANE, WA 99201

EXAMINER	
RODGERS, COLLEEN E	
ART UNIT	PAPER NUMBER
2813	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/212,726	SCHUEGRAF, KLAUS F.	
	Examiner	Art Unit	
	Colleen E. Rodgers	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *60-62,64 and 66* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *60-62,64 and 66* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action responds to the Amendment filed 10 October 2006. Claims 60-62, 64 and 66 are pending.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 60 (and dependent claims 61, 62, 64 and 66) are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 60 limits the invention to providing O_2 into the reactor without passing through an ozone generator. The instant specification as originally presented contained no teachings regarding an ozone generator or specific lack thereof.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 60-62, 64 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Nguyen et al** (USPN 5,356,722) in view of **Ikeda** (USPN 5,593,741) and considered with **Wolf et al**, *Silicon Processing for the VLSI Era, Vol. 1: Process Technology*, Lattice Press: Sunset Beach, CA, 1986, pp. 166-167, for a showing of inherency only.

Regarding claim 60, **Nguyen et al** disclose a semiconductor processing method of depositing an SiO_2 layer comprising:

providing a substrate **12** within a cold-wall, chemical vapor deposition (CVD) reactor **10** [see Fig. 2];

providing RF power of 300 to 1,000 watts, which overlaps 650 watts, and a temperature of 350°C to 450°C within the CVD chamber, which over laps 400°C [see table at col. 4, lines 33-46];

injecting liquid TEOS into the CVD reactor at a flow rate of 400-1,000 sccm, which overlaps 975 sccm [see table at col. 4, lines 33-59] (TEOS is a liquid at room temperature, and is in the gas form when injected into the deposition chamber. As best understood by the Examiner, the TEOS of the instant claims is also gasified prior to injection, as it is injected at 975 sccm, and sccm is a unit of gas measurement).

Regarding the limitation of 975 sccm, **Nguyen et al** form a nitride containing SiO_2 at 400-1,000 sccm and a non-nitrogen-containing SiO_2 at 1,000 sccm. The gas flow rate is an example, and not limiting. One skilled in the art would know that the gas flow is dependent upon the chamber size. Therefore the difference between 975 sccm and 1,000 sccm is dependent merely upon optimization. These ranges are considered to involve routine optimization, while it has been held to be within the level of ordinary skill in the art. See *In re Aller*, 105 USPQ 233, 255 (CCPA 1955). One skilled in the art at the time of invention would have used any ranges of exact figures suitable to the method in the process of deposition regarding flow rates using prior knowledge,

experimentation and observation with the apparatus used in order to optimize the process and produce the SiO_2 layer desired to the parameters desired.

Regarding the limitation of providing O_2 into the reactor at 600 sccm without passing through an ozone generator, **Nguyen et al** teach flowing 1,000-6,000 sccm of ozone into the reactor [see col. 4, line 57]. As 10% of the oxygen is ozone [see col. 4, line 58], **Nguyen et al** then teach 870-5,220 sccm of oxygen that has **not** passed through an ozone generator.

Regarding the limitation of providing He into the reactor at 775 sccm, **Nguyen et al** teach providing He and TEOS at 1,000-5,000 sccm [see col. 4, line 40]. The Examiner states that the volume of gas does not determine the finished product, as the volume of gas would vary with the size of the chamber. It is noted that the instant specification teaches 600 sccm of O_2 and 775 sccm of He, almost a 1:1 ratio. The specification also teaches a gas flow of 975 sccm of TEOS, an approximate ratio of 2:3 (O_2:TEOS) and a 2:5 ratio (O_2:He, TEOS). The gas flows as taught by **Nguyen et al** [see col. 4, lines 56-57] also teach an O_2:He, TEOS ratio of 2:5 and allow for O_2:He ratios in the 1:1 to 6:8 range and an O_2:TEOS ratio of 2:3. Any variance within the gas flow rates taught is one of optimization, as recited above.

Decomposing the TEOS to form SiO_2 and depositing the SiO_2 onto the substrate, the decomposing is conducted at a pressure of from about 5 to about 15 Torr, which overlaps 10-80 Torr [see table at col. 4, lines 33-46].

It is seen to be inherent that the reactor of **Nguyen et al** is a cold-wall reactor, because the heating of the wafers is via the lamp heater **38** located beneath the wafer **15** [see Fig. 2; see also col. 3, lines 58-66]. **Wolf et al** indicates that when the heating comes from within the reaction chamber, that the reactor is called a "cold-wall" reactor, as compared to a "hot-wall" reactor, wherein the heating elements are located externally to the chamber [see pages 166-167].

Nguyen et al do not feed gaseous H_2O_2 into the CVD chamber. **Ikeda** also teaches a plasma CVD method of depositing SiO_2 on a semiconductor substrate in a cold-wall CVD reactor using TEOS, oxygen and H_2O_2. **Ikeda** states that the H_2O_2:

> The obtained film is comparable in the film properties to silicon oxide films deposited by known plasma CVD methods and, when the substrate has steps such as aluminum wiring lines, is **better in step coverage and gap filling capability**. The film exhibits a still better profile when hydrogen peroxide gas or an alternative hydrogen containing gas is added to the reactant gas mixture [emphasis added; see the Abstract].

Regarding claim 61, **Ikeda** discloses that the gaseous precursors of H_2O_2 **234** and TEOS are independently fed into the CVD reactor [see Fig. 11; see also col. 11, lines 60-62].

Regarding claim 62, **Ikeda** discloses that the precursors of H_2O_2 and TEOS are fed into the CVD reactor simultaneously [see Fig. 11; see also col. 11, lines 60-62].

Regarding claim 64, **Ikeda** inherently feeds gaseous H_2O into the CVD reactor at least because the maximum concentration available is 98% H_2O_2 and because H_2O_2 decomposes into H_2O and O as shown to be inherent in **Ikeda** [see the paragraph bridging cols. 11-12].

Regarding claim 66, **Nguyen et al** and **Ikeda** each implicitly teach that the substrate has a high aspect ratio and that the SiO_2 is conformally deposited, because the method "provides improved conformality and void-free gap filling," [see **Nguyen et al**, col. 2, lines 16-21] and is "better in step coverage and gap filling capability" [see **Ikeda**, the Abstract]. "[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." See *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968). See also *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976).

As applied to all of the claims above, it would have been obvious for one of ordinary skill in the art, at the time of invention, to add H_2O_2 to the gas mixture of **Nguyen et al** in order to gain better profile in step coverage and gap fill over high aspect ratio gaps, as taught by **Ikeda**.

Response to Arguments

6. Applicant's arguments filed 10 October 2006 have been fully considered but they are not persuasive. With respect to the rejection under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement, Applicant argues that claim 60 is fully supported by the specification. By way of support for this argument, Applicant argues that "[s]urely the Examiner must recognize that applicant is not required to list in the specification each and every feature which is not present ..." Indeed, the Examiner grants that the Applicant is not required to list every possible feature that is not included in the invention. However, in the instant case, the Applicant is relying on the feature in question to determine patentability, as the claim limitation "without feeding ozone into the reactor" is the only limitation which distinguishes the instant claim from the cited prior art; therefore, it is a critical feature. A critical feature **must** be disclosed in the specification. A critical claim limitation that ozone **cannot** be fed into the reactor must be adequately supported by the specification. In the instant case, the specification does not exclude ozone from being fed into the reactor.

With respect to the prior art rejections, the Applicant argues that the reading out of any element of a claim is improper. However, the Examiner maintains the new matter/enablement rejection under the first paragraph of 35 U.S.C. §112, and therefore the limitation regarding ozone is properly read out of the claim.

Finally, on page 8 of the Remarks, the Applicant argues that the overlapping ranges indicated in the rejection are speculation. The Examiner disagrees. The discussion of ratios of gas flow rates [see page 4 of the rejection above] is sufficient to show that the ranges do indeed overlap, regardless of adjustment for differing chamber sizes.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen E. Rodgers whose telephone number is (571) 272-8603. The examiner can normally be reached on Monday through Friday, 9:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CER

Carl Whitehead

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800